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Trypanosomosis in Goats in Gullele Settlement Areas of Ghibe Valley, South West Ethiopia

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Abstract

A cross-sectional survey was conducted to determine the prevalence of Trypanosomosis, to collect and identify the main vectors involved in the transmission in the newly established Gullele settlement area of the Ghibe valley South West Ethiopia. Blood sample from 280 randomly selected goats collected and examined with direct smear stained with Giemsa. Eight of the goats (2.9%, 95% CI =1.24-5.55%) were found infected with trypanosomosis. The infection were due to *Trypanosoma congolense* (37.5%) followed by *Trypanosoma vivax* (25%), mixed infection of *Trypanosoma congolense* and *Trypanosoma vivax* (25%) and *Trypanosoma vivax* and *Trypanosoma brucei* (12.5%). There was no statistically significant difference (P>0.05) in infection rates between male and female (X^2*=.001, df=1, P=0.981*) and among different age groups(x^2*=0.753, df=1, P = 0.386*). Statistical analysis of the prevalence of trypanosomes at Biftu Jalala and Jiru Gemechu (x^2 *=0.035, df =1, P=0.851*) not significant (P>0.05). Mean PCV values of parasitaemic animals were significantly lower than that of aparasitaemic animals. In an attempt to identify the vector involved in transmission of trypanosomes, *Glossina moristans submoristans*, *Glossina pallidipes* and *Glossina fuscipes* and mechanical vectors of trypanosomes were recorded with their apparent densities of f 0.02, 0.01, 0.03 and 0.02 flies/trap/day, respectively. In conclusion, the study revealed that trypanosomosis is endemic and there is a potential economic use of goats.

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***Key words**: Ghibe, Glossina species, Goat, Settlement*

Introduction

Ethiopia, like most countries in Africa, faces many development challenges, particularly in the sphere of sustainable food production, Livestock and human health, and the conservation of agricultural resources, especially soil and water (Tikubet et al. 2002). 88% of the national farming population of Ethiopia lives on the highland areas which occupy 40% of the country's total area, and overstocking, associated with consequent land degradation, is wide spread (Belete et al. 1991). Partly due to this land pressure, the Government of Ethiopia introduced a policy in 1975 which included resettlement in low lying areas (PMAC 1975).

According to the Institute of Biodiversity Conservation, goats are one of the major economically important livestock species in Ethiopia with a total population of about 23.33 million. They provide their owners with a vast range of products and services such as meat, milk, cash income, security, gifts, religious rituals, and manures. It is estimated that 1,128,000 goats are used in Ethiopia for domestic consumption annually. The habitat of the indigenous goat breeds extend from the arid lowlands to the humid highlands covering even the extreme tsetse infested areas of the country (Workneh 1992). About three quarters of goats are reared in the lowland pastoralist and agro - pastoralists (CSA 2004) where trypanosomosis is endemic.

Until 1976, a total of 98,000km^2 area of Ethiopia was infested by five species of tsetse flies among which the most important are *Glossina morsitans sub morsitans, G. pallidipes G. fuscipes* and *G. tachinoids* whilst *G. longipennis* is of minor economic importance (Langridge 1976). In more recent years, tsetse flies have progressively invaded productive agricultural areas in the West, South and South West parts of Ethiopia. Epidemiology of African trypanosomosis is determined mainly by the ecology of tsetse flies which is found only in tropical Africa. Even though goats are

one of the economically important animals among the rural farming communities (dwellers), information on the prevalence of trypanosomosis is limited. Therefore, the aim of the present study is to determine the prevalence and associated risk factors of trypanosomosis in goats exposed to natural challenges, to assess the level of parasitaemia/degree of anemia and to collect & identify the main vectors involved in transmission of the disease.

Materials and Methods

Study area

The study was conducted in the Ghibe River valley, located 180 km southwest of the capital, Addis Ababa. The area has a sub humid climate with a maximum temperature of 30–37°C and a minimum one of 10–15°C. It receives high and reliable annual rainfall averaging 1100 mm with a low inter-annual variation. In the valley, an estimated 6000 households or 30,000 people are raising 15,000 head of cattle (Macmillan 2002). Ghibe valley has a tropical and sub tropical climatic conditions with bimodal rain fall pattern from March to April and form mid June to the end of October with annual minimum and maximum temperature of 10-15^{0}c and 30-37^{0}c), respectively, and annual rainfall between 1,200 -1,335mm (Dinka and Abebe 2003). In Ghibe valley the natural vegetations have been degraded due to intensive cultivation. However, much of the cultivated lands have scattered trees covers and in some fields different species of bushes and thickets have been grown on soil buds to provide soil protection. There are plenty of games including: Monkey (*Cercopithecus pygerythrus*), Apes (*Cercopithecus acthiops*), Hyenas (*Crocuta crocuta*), Bushbuck (*Tragelaphus scriptus*), Hippopotamus (*Hippopotamus amphibious*), Warthog (*Phacochoerus aithiopicus*), Baboon (*Papio anubis*), Colobus monkey (*Colbus guerega*), Snakes and Bush pig (*Potamochoerusporcus).*

Study population

The study was conducted on 280 goats, out of 2960 goats belonging to two Peasant Associations (PAs), Biftu Jalala and Jiru Gemechu, comprising of 114 and 166 goats, respectively. Age of the animals was estimated by using dentations and grouped into young and adult in the study (Steele, 1996). Animals having no permanent teeth were considered as young animal with one year or less (Steele 1996; Kalu et al. 2001).

Study Methodology

Sampling technique

The households to be sampled within each PAs were selected by simple random technique in proportion of the total householders giving equal chance of being selected. A total of 280 goats were selected by the same randomization from among herd-owners.

Parasitological examination and PCV determination

Blood samples were collected from by ear vein puncture into a pair of heparinized capillary tubes and packed cell volume (PCV) was determined using microhaematocrit (Murray et al. 1977). Animals with PCV value below 24% were considered anemic. After PCV read, the tubes were then snapped 1mm below the buffy coat (BC) to include the top layer red cells. Then the content of the capillary tubes were placed on to a clean side, mixed and covered with cover slip and examined under dark ground phase contrast microscopy for motile trypanosome.

Identification of the parasite was done based on pattern of motility of the parasite across the microscopic field (FAO, 1992). Identification of trypanosome species in a thin blood smears was prepared from positive and anemic animals (PCV of 20% and or less) less than 24% and fixed with 30% methanol for 5 minutes and stained with Giemsa working solution for 30 minutes and examined under x100 objective using oil immersion.

Fly survey

Flies were trapped with cow urine baited biconical traps, constructed from locally made blue and black clothes and deployed for 120 hours (Baylis and Nambiro 1993). Ten biconical traps were deployed for this study along a transect in a 2km. radius within the communal grazing /browsing area, wood lands, and watering points taking in to consideration potential of vegetation cover for the tsetse breeding. Catches were emptied each morning, to minimize death in the trapped tsetse flies. Data on fly species and sex were recorded. Species of tsetse flies were identified on the basis of abdominal coloration /bands/ and tarsal segment coloration.

Data Analysis

Difference in infection rates using the parameters of site, sex and age were analyzed using STATA 7.0 version. PCV values where compared using student's t-test. Significance test was set at $p<0.05$ with 95% confidence level.

Results

Parasitological findings

The overall infection rate of trypanosomosis in the study areas was 2.9% (Table 1). The species of

trypanosome identified were *Trypanosoma congolense* (37.5%), *Trypanosoma vivax* (25%) and mixed infection with *Trypanosoma congolense* and *Trypanosoma vivax* and *Trypanosoma brucei* (12.5%) as well as *Trypanosoma vivax* and *Trypanosoma brucei* (12.5%) with *Trypanosoma congolense* as a predominant parasite. Infection rate of the two age groups were 1.4% and 3.4% for the young and adult goats respectively (Table I). There was no significant difference (P> 0.05) in infection rate between the two age groups. Concerning the comparison of trypanosome infections between the two sexes there was no significant difference (P>0.05) in infection. Nevertheless, a slightly higher prevalence of infection was determined in male goats (2.9%) than in females (2.8%) (Table 1).

Survey on fly-vectors

A total of 68 tsetse flies and 19 *Stomoxys* were captured and identified in the study area. The captured tsetse flies were identified as *Glossina pallidipes*, *Glossina moristans submoristans* and G*losina fuscipes* with *Glossina fuscipes* being the predominant species followed by *Glossina moristans submoristans* and *Glossina pallidipes* respectively.

Table 1: The effect of environmental and host-associated factors on the prevalence of goat trypanosomosis at Ghibe Valley

Risk factors	Number examined	Trypanosome species identified N (%)				Total positive	Infection rate (%)	95% CI	χ^2	df	P-Value
		Tc	Tv	Tc+Tv	Tv+Tb						
PA:											
Biftu Jala	114	2(66)	1(33)	0	0	3	2.6	0.54-7.49	0.035	1	0.851
J/ Gemechu	166	1(20)	1(20)	2(40)	1(12.5)	5	3.0	0.98-6.88			
Sex: Male	69	3(37.5)	1(50)	0	0	2	2.9	0.35-10.08	0.001	1	0.981
Female	211	2(33)	1(50)	2(33)	1(17)	6	2.8	1.05-6.08			
Age: Young	72	0	1(100)	0	0	1	1.4	0.03-7.49	0.753	1	0.386
Adult	208	3(43)	1(14)	1(14)	1(14)	7	3.4	1.36-6.81			
Total overall	280	3(37.5)	2(25)	2(25)	1(12.5)	8	2.9	1.24-5.55			

Key: PA = Peasant association, Tc = Trypanosoma congolense, Tv = Trypanosoma vivax, Tb = Trypanosoma brucei

PCV determination

Slightly higher PCV value of non infected animals was recorded than infected animals (Table 2)

Table 2: Mean PCV (%) of goats in the study area

State of animal	Examined	Mean PCV	SD	t- value	SE	95%CI	
						lower	Upper
Infected	10	22.1	4.56	15.3	1.44	18.84	25.36
Non-infected	10	27.3	2.95	29.3	0.93	25.19	29.41

Table 3: Tsetse and other fly catches at communal grazing/browsing areas of suspected tsetse habitat of Biftu Jalala and Jiru Gemechu of Gullele settlement area of Ghibe valley South West Ethiopia, 2008/09(No of trap = 10).

Fly species	**Sex**		**Total**	**FTD**
	Female	Male		
G.m. sub moristants	14	11	25	0.02
G.pallidipes	7	6	13	0.01
G.fuscipes	22	8	30	0.03

Stomoxys	NI*	NI	19	0.02

NI = Not identified; FTD = Flies/trap/day; G= Glossina, G.m = Glossina moristans*

Glossina fuscipes (22 female and 8 male), 13 *Glossina pallidipes* (6 male and 7 female) and 25 *Glossina moristans sub moristans* (14 female and 11 male) were found (Table 3).

Glossina fuscipes accounted for 34.8% of the flies caught during the survey period while *Glossina moristans submoristans* and *Glossina pallidipes* accounted for 28.7% and 14.9% respectively. During the survey relatively *Stomoxys* were collected along with tsetse flies. The apparent densities of 0.03, 0.02, 0.01 and 0.02 flies/trap/day were obtained for *Glossina fuscipes*, *Glossina moristans submoristans*, *Glossina pallidipes* and *Stomoxys*, respectively in the present study (Table 3).

Discussion and conclusion

The prevalence of trypanosomosis obtained in this study (2.9%) is higher than the findings of Lemecha et al (2002) and Anosa et al. (1993) in Ethiopia and Nigeria, respectively. Lemecha et al. (2002) has reported 0.4%, while Anosa et al. (1993) reported 1.0%. The result of the present study is lower than the findings of[5] in Gamo Gofa, with an overall prevalence of 5.42%. This might be attributed to the seasonal difference of the study periods. The morbidity rates during outbreaks are lower in goats since these are not often the preferred hosts for tsetse or are less exposed to tsetse challenges. Goats are more vigorous than cattle in defending themselves against successful feeding by tsetse flies (Seifert 1996; Snow et al. 1996). Goats have been reported to be resistant to trypanosomosis (Oladele and Adengan 1998). However, several studies on the prevalence of trypanosomosis in goats in different countries such as Nigeria, Kenya and Tanzania revealed that goats acquire natural infection resulting in economic losses (Griffin and Allonby 1979; Katunguka 1996).

In the present study, mainly *T. congolense* and *T.vivax* were identified as a cause of goat trypanosomosis. Radostitis *et al.* (2007) and Vilenberg (1998) concluded that *T.congolense* and *T.viuax* are responsible for sever trypanosomosis in cattle, sheep and goats. *T.brucei* was encountered only once as a mixed infection with *T.vivax* by microscopic examination of Buffy coat in the area studied agree with published reports in Ethiopia (Dinka and Abebe 2003) and Masiga et al. (2002) in Kenya.

There was no statistically significant difference observed (P>0.05) in infection rate between Biftu Jalala and Jiru Gemechu PAs. The reason might be attributed to the existence of similar ecology for both sites. Likewise, there was no significant difference (P>0.05) in infection rate between the two sexes of goats though, high infection rate recorded in males than females this is incoherence with the findings of Kalu et al. (2001).

No significant (P>0.05) difference was observed in infection rate between young and adult goats even though higher infection rates was recorded in adult goats. This finding agreed with the work of Kalu et al. (2001) and Dinka and Abebe (2003) who found a higher infection rates in adults than young goats in Kenya and Ethiopia, respectively. On the other hand, low prevalence of trypanosome infections in young animals has been observed by Stephen (1986), Murray and Dexter (1988) and Bealby et al. (1996) who concluded that young animals are less exposed to the disease than adults to lack of long association of young animals with the vectors of trypanosomosis. Influence of husbandry system was reflected in the pattern of age groups affected by the disease; young animals were less exposed since they were tethered or kept close to the homesteads where tsetse habitat has been destroyed (Leak et al. 1993; Muturi et al. 2000).

In the present study mainly *T. congolense* and *T. vivax* were identified as a cause of goat trypanosomosis that agreed with Radostitis et al. (2007) and Vilenberg (1998) who concluded *T. congolense* and *T. vivax* are responsible for severe disease in cattle, sheep and goats. *T. congolense* was more prevalent than *T. vivax* accounting for 37.5% and 25% respectively. *T. brucei* was encountered only once as a mixed infection with *T. vivax* by microscopic examination of buffy coat in the area studied agree with published reports in Ethiopia (Dinka and Abebe 2003) and in Keneya (Masiga et al. 2002)

During the survey period, *Glossina moristans submoristans*, *G. Pallidipe*s and *G. fuscipes* were the only species of tsetse detected in the study areas. This result agreed with the ones of Leak et al. (1993) at Ghibe valley. They reported that within the valley, *Glossina pallidipes* was the predominant species detected. However, in the present study *G. fuscipes* was the predominant caught during the study period followed by *G.m.sub moristance* and *G.pallidipes* respectively. Muturi et al. *(*2000) reported from North Omo that *G. pallidipes* and *G.fuscipes* were the two species found in the study area, with *G.pallidipes* being

the predominant species. Verysen et al. (1998) reports agreed with the findings of Muturi et al. (2000).

In conclusion, the prevalence of trypanosomosis in goats was found to be lower in the study area where these animals might perform better in trypanosomosis endemic areas. Creation of awareness of the farmers is mandatory precondition for community to actively participate and launch a sustainable tsetse and trypanosomosis control programs that could overcome the menace confronted in the newly established settlement areas.

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